Apache Zeppelin & Cluster

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• SDE @ ZEPL
• PMC member of Apache Zeppelin
• Recently interested in,
  • Enterprise-ready
  • Multi-tenancy
  • Cluster itself
Abstract

• Apache Zeppelin Overview - Plug-in, Plug-in, Plug-in

• Interpreter
  • Three Modes - Shared, Scoped, Isolated w/ Local Processes
  • Yarn Cluster Manager - Spark, Livy
  • New Cluster Managers - Mesos, Docker
  • Further issues - Impersonation, Resources Sharing
Interpreter

- 24 interpreters currently
- Gateway
  - To execute code to external services
  - To obtain results from external services
  - Separate process to avoid conflict of dependencies
  - InterpreterSetting to set env and properties
Interpreter Modes

Demo
## Interpreter Modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Process</th>
<th>Context</th>
<th>Stop on Note</th>
<th>Stop on Interpreter Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared</td>
<td>1</td>
<td>1</td>
<td>ALL</td>
<td>ALL</td>
</tr>
<tr>
<td>Scoped</td>
<td>1</td>
<td>N</td>
<td>One Context</td>
<td>ALL</td>
</tr>
<tr>
<td>Isolated</td>
<td>N</td>
<td>1</td>
<td>One process</td>
<td>ALL</td>
</tr>
</tbody>
</table>
Yarn Cluster Manager

• All interpreters in Yarn cluster
• No local process
• (Almost) same behaviors as local process
• Lifecycle manager of Yarn
• Setting “zeppelin.cluster_manager” to “yarn”
• YarnRemoteInterpreterServer
Yarn Cluster Manager

Demo
Yarn CM: Spark

- SPARK_HOME and Embedded spark
- “local[*]” and “yarn-client”
- Spark, sql, pyspark, r simultaneously
- Zeppelin.yarn.memory, spark.driver.memory, spark.yarn.amMemory
Yarn CM: Livy

• Firewall
• Usage of Resources
• Compatibility
Yarn CM: Livy - Firewall

Diagram showing a ZeppelinServer connected to a Yarn Cluster through a Firewall, with blocked connections indicated by "X" marks.
Yarn CM: Livy - Firewall

ZeppelinServer → Livy → Yarn Cluster

Firewall
Yarn CM: Livy - Resource Usage

Spark’s yarn-cluster mode
yarn-client mode in Yarn Cluster Manager
Yarn CM: Livy - Compatibility

• Zeppelin
  • > 1000 lines of code in SparkSubmit.scala
  • > 500 lines of code in RemoteInterpreterYarnProcess

• Livy
  • Only check a new version needed
  • less than Zeppelin’s Yarn Cluster Manager
## Yarn CM: Livy

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| **Yarn CM**                 | • One-way firewall  
                           | • No additional server  
                           | • No yarn-cluster  
                           | • Two AMs on yarn-client  
                           | • Custom spark-submit |
| **Livy**                    | • Yarn-cluster  
                           | • Vanilla spark-submit  
                           | • Bi-directional firewall  
                           | • Additional server |
New Cluster Manager

- Only four methods
- RemoteInterpreterProcess should provides host and port for thrift
- Mesos, docker

```java
public abstract class ClusterManager {
    public abstract void start();
    public abstract void stop();
    public abstract RemoteInterpreterProcess createInterpreter(String... s);
    public abstract void releaseResource(String id);
}
```
Impersonation

- Different ways of implementations
  - JDBC’s properties vs. Hadoop’s UserGroupInformation
- Different point to be adopted
  - Process vs. application
- Different starting point
  - Shiro or not
- Need to provide an unified way
Resource Sharing

- Visualization
- Spell
- Helium
- Resource Pool
- SparkContext
- JDBC Conn.
- Storage
- Interpreter
- Spark
- Python
- JDBC
- Shell
Question or Opinion